

**WHAT IS CLAIMED IS:**

1. A process for manufacturing a high octane alkylate comprising the steps of:
- 5 (a) obtaining a C<sub>3</sub>-C<sub>4</sub> light olefin fraction from a Fischer-Tropsch reaction;
- (b) treating the olefin fraction with a dehydration/isomerization catalyst which converts alkanols to olefins and isomerizes the C<sub>4</sub> olefin portion of the fraction;
- 10 (c) optionally treating the olefin fraction from step (b) to reduce the oxygenate level to no more than about 4000 ppm;
- (d) mixing the treated olefin fraction with an isoparaffin stream comprising isobutane;
- (e) reacting the combined stream from step (d) in the presence of an alkylation catalyst; and
- 15 (f) recovering a highly branched isoparaffinic alkylate having a research octane number of at least about 80.
2. A process according to claim 1, wherein the isoparaffin stream is obtained from a Fischer-Tropsch reaction, natural gas or petroleum.
3. A process according to claim 2, wherein the isoparaffin stream is
- 20 obtained by subjecting a 300°F+ fraction to hydrotreating, hydrocracking, hydrodewaxing or combinations thereof.
4. A process according to claim 1, wherein the olefin fraction in step (d) has an oxygenate content of less than about 2500 ppm.
5. A process according to claim 4, wherein the oxygenate content of
- 25 the olefin fraction is less than about 1000 ppm.

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6. A process according to claim 1, wherein at least a portion of oxygenates present in the C<sub>3</sub>-C<sub>4</sub> olefin fraction are removed by water washing, decarboxylation, adsorption, distillation or combinations thereof.

5 7. A process according to claim 6, wherein the distillation comprises extractive or azeotropic distillation.

8. A process according to claim 1, where the highly branched isoparaffinic alkylate has a octane number of at least about 90.

9. A process according to claim 8, wherein said alkylate has an octane number of at least about 95.

10 10. A process according to claim 1, wherein the dehydration/isomerization catalyst produces a C<sub>3</sub>-C<sub>4</sub> olefin mixture where the molar ratio of 2-butene to total butenes is at least 0.1.

11. A process according to claim 1, wherein the olefin fraction used in step (d) has an acid value of at least 4.

15 12. A process according to claim 1, wherein a C<sub>5</sub> to 300°F fraction containing propanol and butanol is recovered from the Fischer-Tropsch reactor and is admixed with the C<sub>3</sub>-C<sub>4</sub> olefin fraction before contact with the dehydration/isomerization catalyst.

20 13. A process according to claim 1, wherein the dehydration/isomerization catalyst comprises alumina, silica-alumina, a zeolite, a clay or combinations thereof.

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14. A process according to claim 1, wherein the dehydration/isomerization is conducted at a temperature of about 50°-900°F, a pressure greater than 0 up to about 2000 psig and an LHSV greater than 0.01 hr<sup>-1</sup>.

5 15. A process according to claim 14, wherein the temperature is between about 300°-600°F, the pressure is between about 5-250 psig and the LHSV is between about 1.0-5.0 hr<sup>-1</sup>.

16. A process according to claim 10, wherein the molar ratio of 2-butene to total butenes is at least about 0.3.

10 17. A process according to claim 16, wherein the molar ratio of 2-butene to total butenes is at least about 0.5.

18. A process of manufacturing an alkylate which is highly branched, has a high isoparaffin content and has an octane number of at least about 80, comprising:

15 (a) reacting a mixture containing CO and H<sub>2</sub> in the presence of a Fischer-Tropsch catalyst;

(b) recovering a mixture of hydrocarbonaceous products including a light olefin C<sub>3</sub>-C<sub>4</sub> fraction containing propylene, butylene, alkanols and organic acids; a C<sub>5</sub> to 300°F naphtha fraction; and a 300°F+ fraction;

20 (c) subjecting the 300°F+ fraction to hydrotreating, hydrocracking, hydrodewaxing or combinations thereof and recovering a fraction containing at least about 30 wt. % isobutane;

(d) contacting the light olefin C<sub>3</sub>-C<sub>4</sub> fraction with a catalyst which dehydrates alkanols to alkenes and isomerizes 1-butene to 2-butene;

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(e) subjecting the dehydrated/isomerized C<sub>3</sub>-C<sub>4</sub> olefin fraction from step (d) to a water washing, decarboxylation, distillation, adsorption or combination thereof to reduce the oxygenate content to less than 4000 ppm;

(f) admixing the isobutane-containing fraction from step (c) with the C<sub>3</sub>-C<sub>4</sub> olefin fraction from step (e);

(g) reacting the admixture from step (f) in the presence of a liquid phase alkylation catalyst; and

(h) recovering said alkylate.

19. A process according to claim 18, wherein the oxygenate content of the olefin fraction in step (e) is below 1000 ppm.

20. A process according to claim 18, wherein the dehydration/isomerization is conducted in the presence of a weakly acidic catalyst comprising alumina, alumina/silica, a zeolite, a clay or combinations thereof, at a temperature of 100°-400°F, a pressure of 20-250 psig, an LHSV of 1.0-5.0 hr<sup>-1</sup> and the product has a molar ratio of 2-butene to total butenes of at least 0.3.

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